FOUNDATIONS OF FLIGHT
RAM-AIR PARACHUTE AERODYNAMICS—AIRFLOW

Brought to you by Niklas Daniel and Brianne Thompson of AXIS Flight School at Skydive Arizona in Eloy. Image(s) by Bruce Fournier.

In previous articles, we discussed some of the inner workings and properties of a ram-air parachute. In this installment, we will take a closer look at how air flows into and around a ram-air parachute.

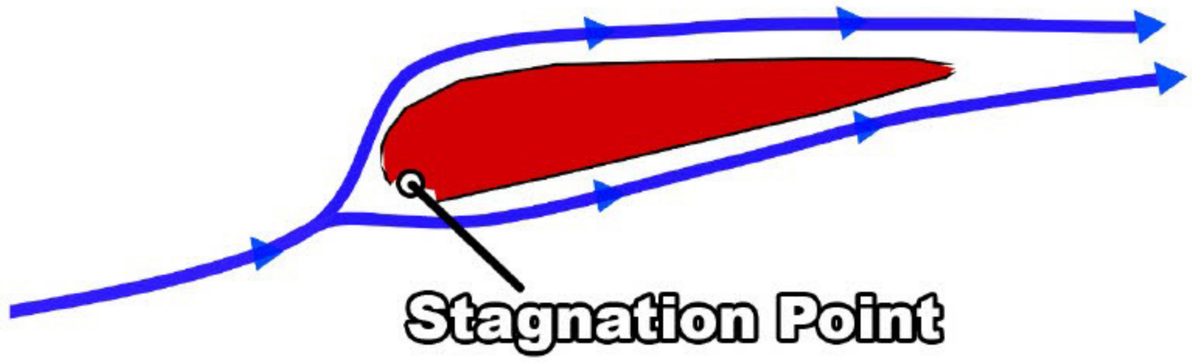
More educational skydiving content, as well as this free article, is available by downloading the AXIS Skydiving app on your smart device.

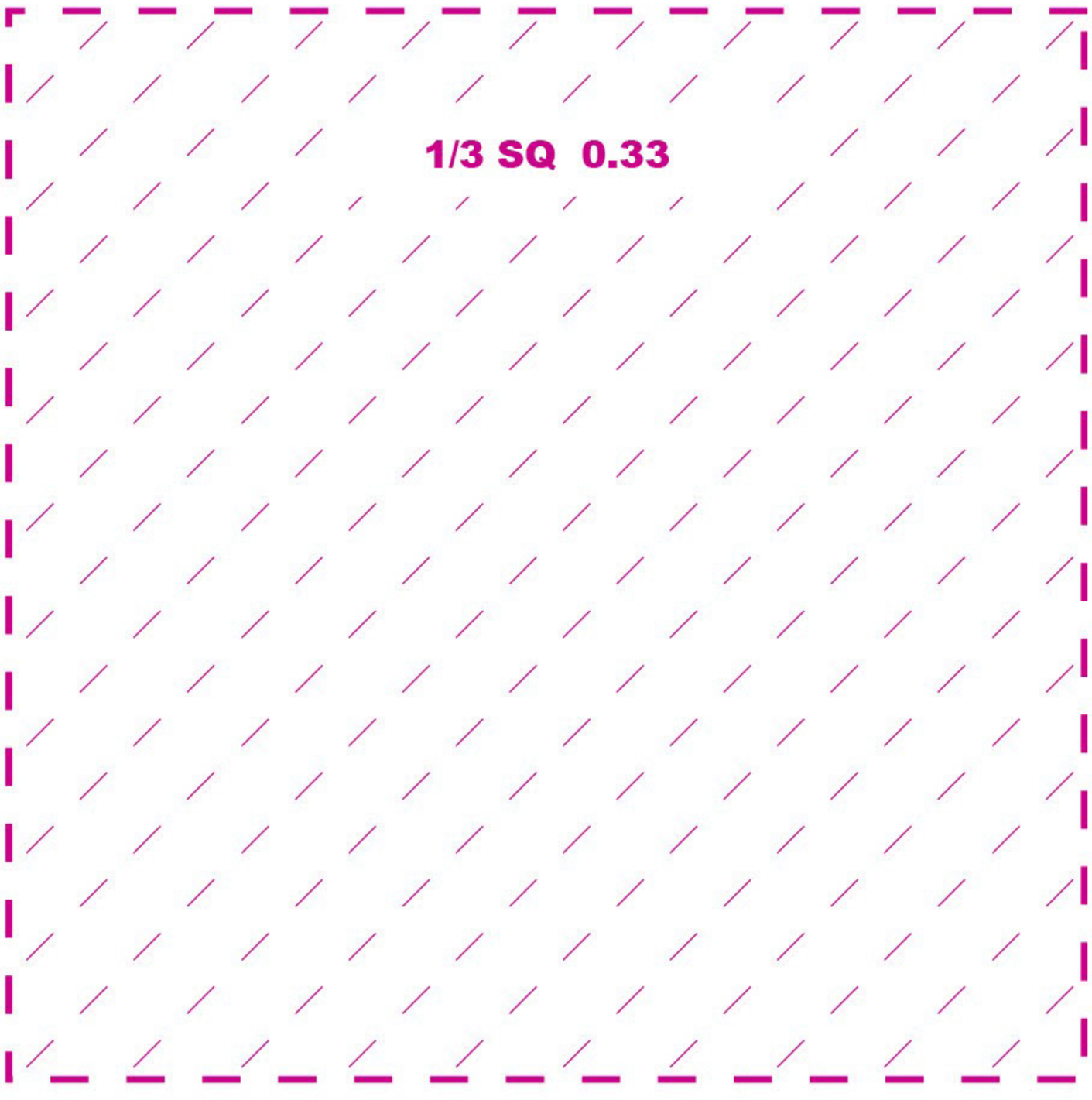
INTERNAL

Imagine filling a glass with water until it starts to overflow. The liquid inside the glass has taken up all the available room and is essentially blocking any new arriving water from entering. This is similar to what happens to air as it fills up the cells of a parachute. Once inflation during the opening process is complete (deployment), any new arriving air that tries to enter the cells at the leading edge gets diverted either up and over the top skin or down past the bottom skin. The location where this change in flow occurs is called the stagnation point and marks the highest pressure on the wing's profile. When the canopy is inflated, the stagnation point is located at the cell opening, which is close to the bottom skin just behind the leading edge. The air flowing above and below the wing creates forces we will discuss in more detail in an upcoming article.

Inside the wing there are strategically placed holes in the ribs called cross ports, which allow air to flow between cells. This helps distribute the internal pressure more evenly throughout the wing, a critically important feature for a parachute to regain its shape quickly after a deformation. Changes in a wing's shape are produced by a pilot's inputs or when flying through turbulence (or contacting a person, if you are a canopy formation skydiver).

Information about AXIS' coaching and instructional services is available at axisflightschool.com. *The author intends this article to be an educational guideline. It is not a substitute for professional instruction.*





EXTERNAL

As a parachute advances through the air, our movement is apparent to us as we feel and hear the flow of air rushing past us. The direction of this airflow emanates from our trajectory, aka flight path, and is referred to as the relative wind. The pace at which one flies through the air is called airspeed and can be manipulated with control inputs by the pilot. We can associate airspeed with wind noise, because the faster we fly, the louder it gets. Inversely, the slower we fly, the quieter the wind noise gets. These are tangible sensations competent pilots use to aid in their decision making. The application extends beyond normal flight and can be use during landings, malfunctions (high vs. low speed) and stall recognition, just to name a few.

In the next installment we will go into more detail about the forces that are produced as a wing interacts with the air it flies through.